Utah
Carbon Capture and Geologic Sequestration (CCGS) Workgroup Meeting

8 September 2008

9:00 am to 12 Noon MST

Room 101, 168 North 1950 West

Salt Lake City, Utah

Welcome and Introductions

What is Carbon Capture and Geologic Sequestration (CCGS)?

Process by which Carbon Dioxide (CO_2) is:

- separated from gases emitted by large stationary sources and collected (captured),
- compressed to a supercritical state (T_c = 31.1 °C, P_c = 73.9 bars $\cong$ 1,072 psi) and transported via pipeline,
- injected underground via specially constructed wells into suitable deep geologic formations for long-term isolation (sequestration) from the atmosphere.

A Simplified Overview of the Carbon Capture and Geologic Sequestration Process

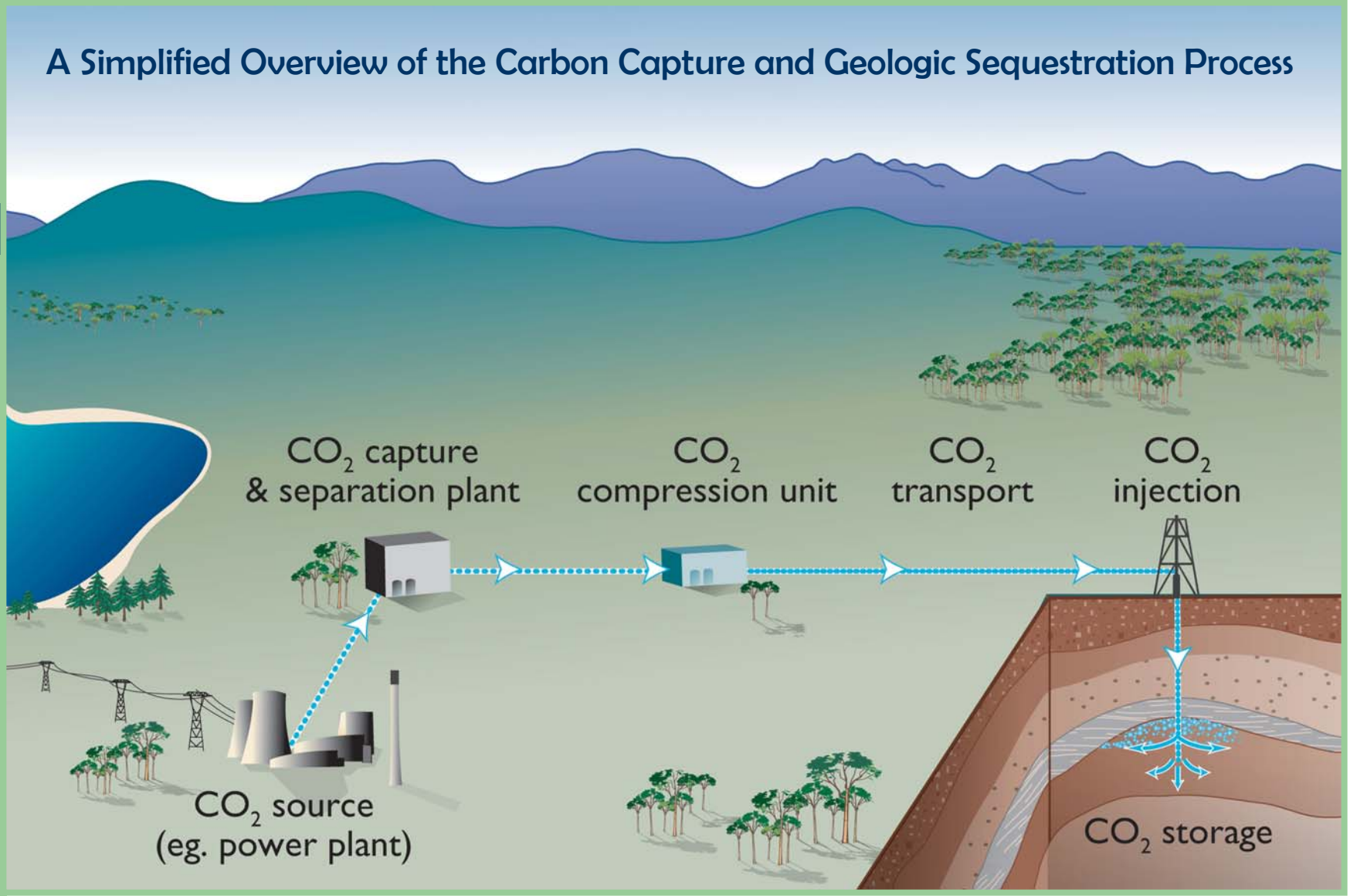


Image Source: http://www.co2crc.com.au/

What is Carbon Capture and Geologic Sequestration (CCGS)?

This workgroup is concerned with a specific type of carbon capture and storage (CCS), that is carbon capture and geologic storage, or sequestration, so we will refer to it as CCGS rather than CCS to distinguish it from other types of sequestration, namely terrestrial sequestration or ocean storage.

Utah Senate Bill 202 - Energy Resource and Carbon Emission Reduction Initiative

Governor Huntsman signed this bill into law on March 18, 2008; enacted and/or amended:

- Municipal Electric Utility Carbon Emission Reduction Act – Title 10 Chapter 19
- Energy Resource Procurement Act – Title 54 Chapter 17

Municipal Electric Utility Carbon Emission Reduction Act – Title 10 Chapter 19

- To the extent that it is cost-effective to do so, beginning in 2025 the annual retail electric sales in this state of each municipal electric utility shall consist of qualifying electricity [including "qualifying carbon sequestration generation"] or renewable energy certificates in an amount equal to at least 20% of adjusted retail electric sales.
- "Qualifying carbon sequestration generation" means a fossil-fueled generating facility located within the geographic boundary of the Western Electricity Coordinating Council that:

  (a) becomes operational or is retrofitted on or after January 1, 2008; and

  (b) reduces carbon dioxide emissions into the atmosphere through permanent geological sequestration or through other verifiably permanent reductions in carbon dioxide emissions through the use of technology.

Energy Resource Procurement Act – Title 54 Chapter 17

54-17-701. Rules for carbon capture and geological storage.

(1) By January 1, 2011, the Division of Water Quality and the Division of Air Quality, on behalf of the Board of Water Quality and the Board of Air Quality, respectively, in collaboration with the commission and the Division of Oil, Gas and Mining and the Utah Geological Survey, shall present recommended rules to the Legislature's Administrative Rules Review Committee for the following in connection with carbon capture and accompanying geological sequestration of captured carbon:

(a) site characterization approval;
(b) geomechanical, geochemical, and hydrogeological simulation;
(c) risk assessment;
(d) mitigation and remediation protocols;
(e) issuance of permits for test, injection, and monitoring wells;
(f) specifications for the drilling, construction, and maintenance of wells;
(g) issues concerning ownership of subsurface rights and pore space;
(h) allowed composition of injected matter;
(i) testing, monitoring, measurement, and verification for the entirety of the carbon capture and geologic sequestration chain of operations, from the point of capture of the carbon dioxide to the sequestration site;
(j) closure and decommissioning procedure;
(k) short- and long-term liability and indemnification for sequestration sites;
(l) conversion of enhanced oil recovery operations to carbon dioxide geological sequestration sites; and
(m) other issues as identified.

Energy Resource Procurement Act – Title 54 Chapter 17

(2) The entities listed in Subsection (1) shall report to the Legislature's Administrative Rules Review Committee any proposals for additional statutory changes needed to implement rules contemplated under Subsection (1).

(3) On or before July 1, 2009, the entities listed in Subsection (1) shall submit to the Legislature's Public Utilities and Technology and Natural Resources, Agriculture, and Environment Interim Committees a progress report on the development of the recommended rules required by this part.

(4) The recommended rules developed under this section apply to the injection of carbon dioxide and other associated injectants in allowable types of geological formations for the purpose of reducing emissions to the atmosphere through long-term geological sequestration as required by law or undertaken voluntarily or for subsequent beneficial reuse.

Energy Resource Procurement Act – Title 54 Chapter 17

(5) The recommended rules developed under this section do not apply to the injection of fluids through the use of Class II injection wells as defined in 40 C.F.R. 144.6(b) for the purpose of enhanced hydrocarbon recovery.

(6) Rules recommended under this section shall:

a) ensure that adequate health and safety standards are met;

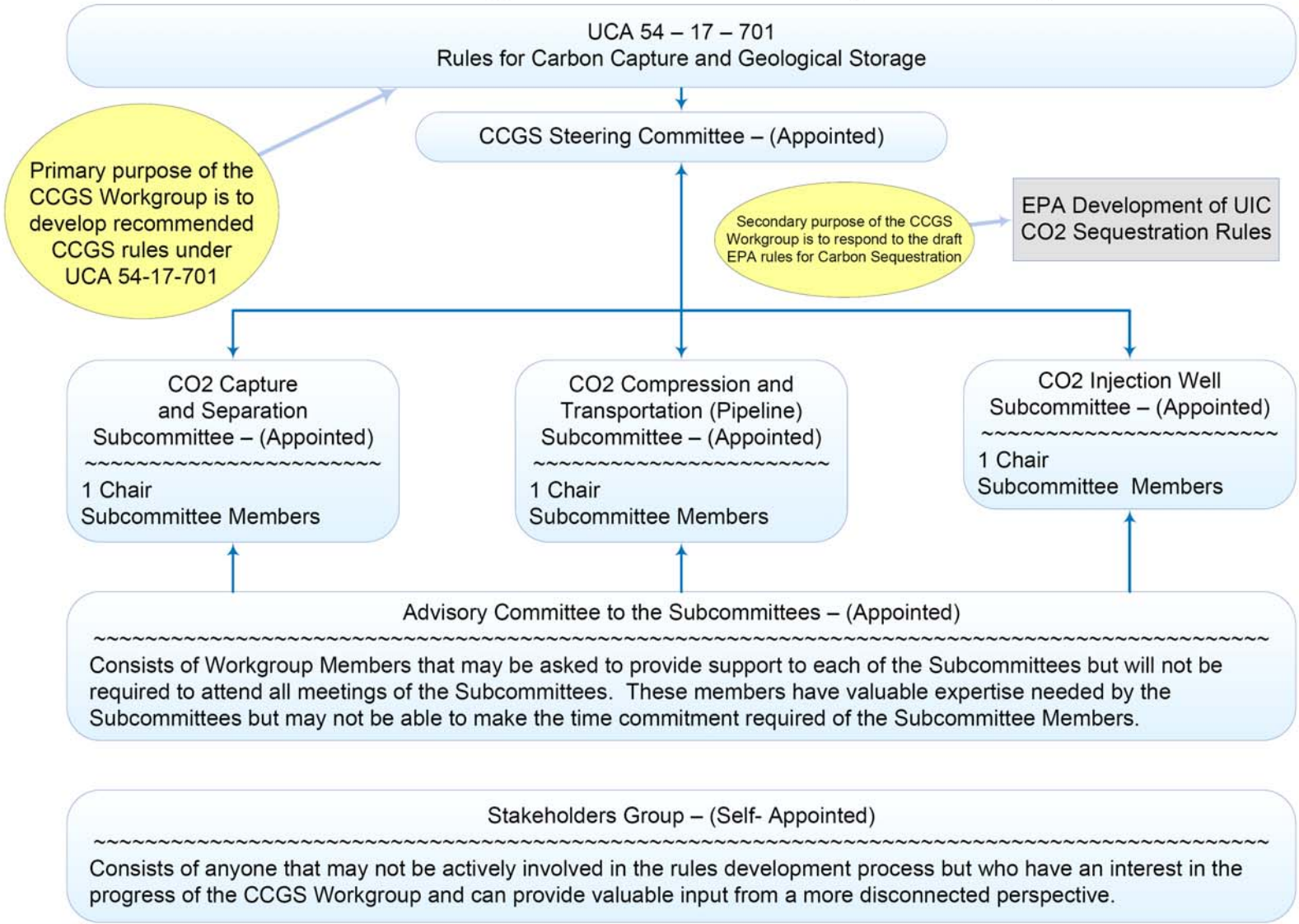
b) minimize the risk of unacceptable leakage from the injection well and injection zone for carbon capture and geologic sequestration; and

c) provide adequate regulatory oversight and public information concerning carbon capture and geologic sequestration.

CCGS Workgroup Organization

Process for Development of Carbon Capture and Geologic Sequestration (CCGS) Rules

Under the Energy Resources Procurement Act (UCA 54-17-701)

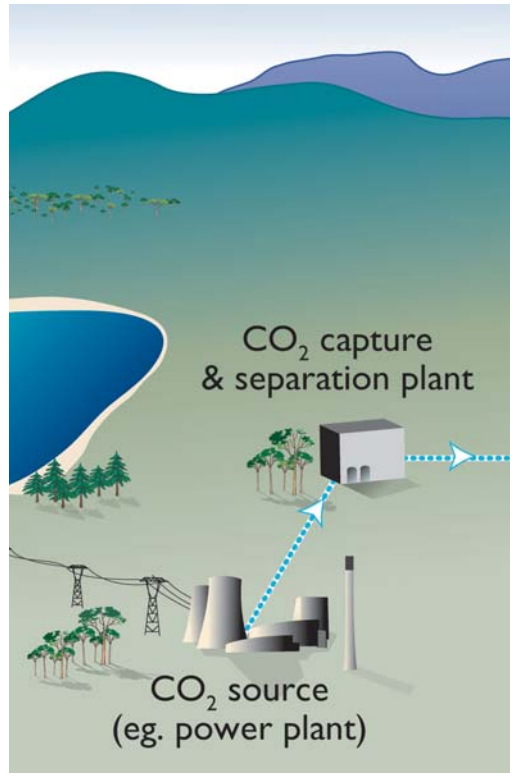


CCGS Workgroup Steering Committee

- Coordinate with legislative Administrative Rules Review Committee and Public Utilities and Technology and Natural Resources, Agriculture, and Environment Interim Committees
- Coordinate response to EPA draft rule for carbon sequestration
- Identify and address cross cutting issues – e.g. composition of captured and sequestered CO2 (water content, H2S, other contaminants) (1)(h)
- Update Carbon Capture and Geologic Sequestration web page with information about the CCGS Workgroup and information about CCGS (6)(c)
- …

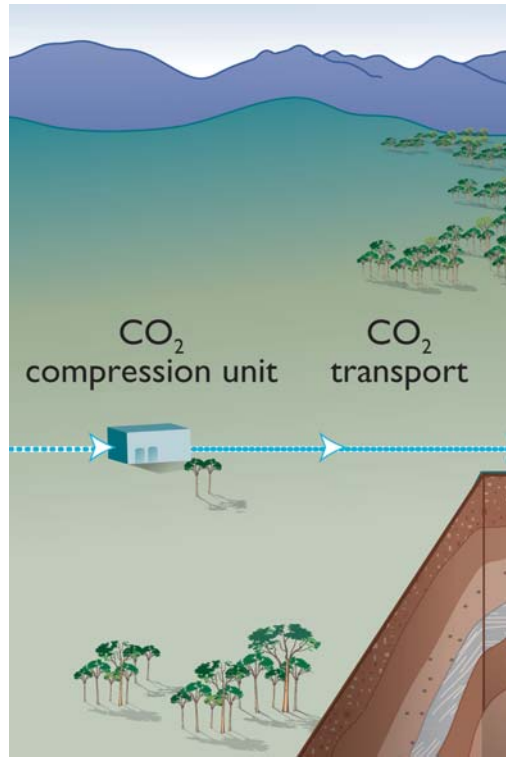
CCGS Workgroup CO2 Capture and Separation Subcommittee

- Identify and prepare recommended new regulations and changes to existing regulations (6)(c)
- Identify and articulate needs for new statutes (6)(c)
- Identify additional stakeholders – large stationary sources affected by CCGS rules
- Coordinate with Steering Committee on CO2 composition requirements (1)(h)
- Ensure Health and Safety Plans are included in work plans for the construction and operation of capture and separation plant (6)(a)
- Address capture/separation associated with different capture systems: industrial processes (cement plants, natural gas processing), pre-combustion, post-combustion, and oxy-fuel combustion; and for different capture technologies: sorbents, solvents, membrane, cryogenic, etc.
- …



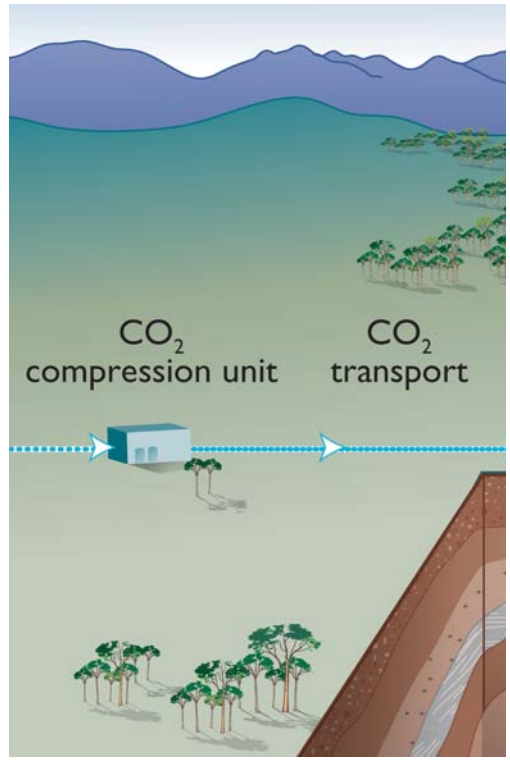
CCGS Workgroup CO2 Compression and Transportation Subcommittee

- Identify and prepare recommended new regulations and changes to existing regulations (6)(c)
- Identify and articulate needs for new statutes (6)(c)
- Address whether or not there is a need to define "pipeline quality" CO2
- Identify additional stakeholders – land managers, etc.
- Coordinate with US DOT Pipeline and Hazardous Materials Safety Administration (US DOT PHMSA) as necessary; 49 CFR 195 applies to transport of CO2 by pipeline
- Address siting criteria (1)(a)
- Address risk assessment as it relates to siting criteria and operation and maintenance requirements (1)(c) and (6)(b)
- Address corrective action protocols (1)(d)
- Address issues pertaining to pipeline right of way (1)(m)



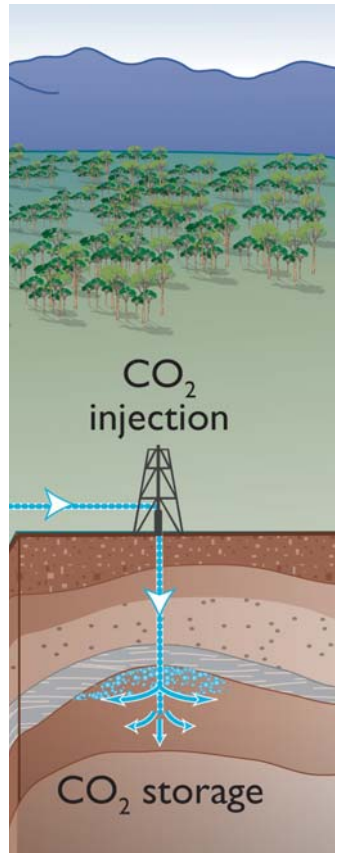
CCGS Workgroup CO2 Compression and Transportation Subcommittee

- Coordinate with Steering Committee on CO2 composition requirements (1)(h)
- Ensure Health and Safety Plans are included in work plans for the construction of pipeline and for the operation of pipelines (6)(a)
- Address compressor requirements specific to CO2 transport
- Address physical state of CO2 (gas or supercritical) transport
- …



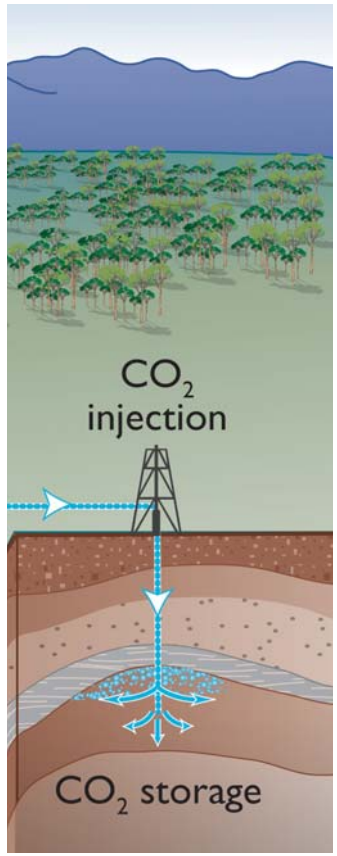
CCGS Workgroup CO2 Injection Well Subcommittee

- Identify and prepare recommended new regulations and changes to existing regulations (6)(c)
- Identify and articulate needs for new statutes (6)(c)
- Identify additional stakeholders
- Address siting criteria (1)(a)
- Address geomechanical, geochemical, and hydrogeological parameters as they pertain to siting criteria and operational requirements (1)(b)
- Address risk assessment as it relates to siting criteria and operation and maintenance requirements (1)(c) and (6)(b)
- Address corrective action protocols (1)(d)
- Address issuance of permits for test, injection, and monitoring wells (1)(e)
- Address Drilling and Construction Work Plans for the test, injection, and monitoring wells (1)(f)



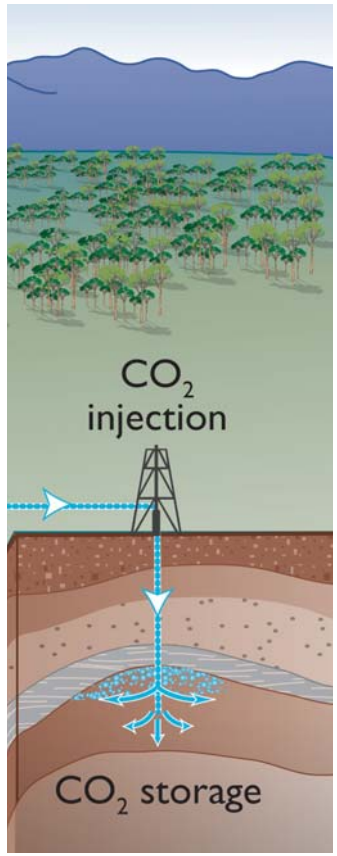
CCGS Workgroup CO2 Injection Well Subcommittee

- Address issues concerning ownership of subsurface rights and pore space (1)(g)
- Coordinate with Steering Committee on CO2 composition requirements, consider composition requirements for reuse (1)(h)
- Address MMV during operation, closure, and post-closure periods (1)(i)
- Address closure and decommissioning procedure for test, injection, and monitoring wells and surface facilities (1)(j)
- Address liability and indemnification (1)(k)
- Address conversion of EOR to CCGS (1)(l)
- Address Area of Review (AOR) (1)(m)
- Address issues pertaining to subsequent beneficial reuse of sequestered CO2 (1)(m)



CCGS Workgroup CO2 Injection Well Subcommittee

- Ensure Health and Safety Plans are included in work plans for the construction of wells and for the operation of wells (6)(a)
- Identify and address as appropriate any other legal issues (1)(m)
- Identify and address multi-agency authority
- …



CCGS Workgroup Advisory Committee

- Provide assistance to Steering Committee and Subcommittees
- …

CCGS Workgroup Stakeholder Group

- Provide input to rule making process through Stakeholder Group Chair
- …

CCGS Workgroup Purpose

1. Develop Recommended Rules for Implementing CCGS in Utah per Energy Resource Procurement Act
2. Prepare comments to EPA on proposed Class VI Injection Well rule by November 24, 2008
3. Discussion – Have we captured all we are required to address by UCA 54-17-701?

CCGS Workgroup Membership

Sectors represented:

- Legal
- Local Government
- Public Health, Safety, and Security
- Power Generators & Distributors
- Oil and Gas Industry
- Environmental
- DNR
- DEQ/EPA
- Public Service Commission
- Land Managers
- Technical Experts
- Energy Policy Makers

Legal Issues – Denise Chancellor

Focused Discussion

1. How will we conduct business?
2. How will we reach agreement?
3. How often will we meet?
4. What will be our deliverables?
5. Working documents on CCGS Workgroup web page: http://www.climatechange.utah.gov/CCGS_WG.htm

Action Items

1. Each subcommittee determine additional tasks to be addressed and report back to steering committee
2. Each subcommittee determine additional stakeholders to be represented
3. . . .
4. . . .